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Patentanmeldung Nr. Patent application No. Demande de brevet n°

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Liquid cartridge for use in a beverage system

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**Liquid cartridge for use in a beverage system**

The invention relates to a device for providing a heated liquid, said device comprising a liquid transport channel in connection with a liquid reservoir, which discharges into a first chamber, said first chamber comprising a steam inlet which is connectable to a steam generator, a second chamber which is connected to the first chamber via a restriction, and which has a liquid outlet.

The invention furthermore relates to a beverage making appliance for use with such a device for providing a heated liquid, and a system for preparing a beverage, comprising a beverage making appliance and a device for providing a heated liquid.

A device as described in the opening paragraph is known for example from EP 0858757 A1. The known device is a device for use with an espresso machine, and comprises a liquid transport channel in connection with a liquid reservoir. In this device, the liquid comprises milk. The liquid transport channel discharges into a first chamber, which comprises a steam inlet which is connectable to a steam generator of the espresso machine. A second chamber, in this device a channel, is connected to the first chamber via a restriction, and has a liquid outlet. During operation, milk and air are being drawn into the first chamber via an underpressure in the first chamber. In the first chamber, steam is mixed with this milk and air to heat the mixture, after which the mixture is transported to the channel in which the mixture is stabilized. After stabilization, the mixture leaves the liquid outlet as heated milk froth.

It is a disadvantage of the known device that it requires frequent cleaning. Because of the fact that during operation milk is in contact with the components of the device, these components become polluted with milk. If the device is not frequently cleaned, the device will become unhygienic because of milk residue and may cause health problems for its users. This risk is even larger because the construction of the device renders cleaning difficult, which may cause users to be reluctant to clean it.

It is an object of the invention to provide a device for providing a heated liquid, which is hygienic and user-friendly. To achieve this object, a device for providing a heated liquid according to the invention is characterized in that the device for providing a heated liquid comprises a cartridge in which the liquid reservoir, the liquid transport channel, the first chamber, the steam inlet, the restriction, the second chamber and the liquid outlet are provided. Because of the fact that all components of the device are integrated into one cartridge, the cartridge can be disposed off after use. In this manner all components which have been in contact with liquid during operation, and which run the risk of becoming contaminated by residues of liquid, are removed and thrown away. Thus a hygienic device is provided which is also user-friendly because it does not have to be cleaned after use.

An embodiment of a device according to the invention, for use with a beverage making appliance, is characterized in that the device is at least partly detachably connectable to the beverage making appliance. In this manner, the cartridge can be detached from the beverage making appliance after having fulfilled its function, and then be disposed of.

An embodiment of a device according to the invention is characterized in that the cartridge is detachably connectable to the appliance via the steam inlet. In this manner the device is in contact with the appliance only via the steam inlet, which means that no liquid present in the cartridge can come into contact with any part of the appliance. This ensures a hygienic solution without the need for the user to clean the device or the appliance.

An embodiment of a device according to the invention is characterized in that the liquid transport channel comprises an air inlet. In this manner air is entrained into the liquid during operation, when the liquid is being transported from the reservoir via the transport channel to the first chamber. This air causes a frothing of the milk.

An embodiment of a device according to the invention is characterized in that the air inlet is closable. In this manner either heated liquid, or heated frothed liquid can be generated by the device, depending on whether the air inlet is closed or opened, respectively.

It is advantageous when a valve is provided for opening and closing the air inlet 18.

An embodiment of a device according to the invention is characterized in that the liquid comprises milk. In another embodiment, the liquid comprises liquid coffee extract.

An embodiment of a device according to the invention is characterized in that the first chamber comprises a water inlet 31 which is connectable to a water reservoir. When using condensed milk or liquid coffee extract as a liquid in the cartridge, additional water has

to be mixed into the mixture to obtain a good quality heated liquid. This is possible via the water inlet.

An embodiment of a device according to the invention is characterized in that at least the second chamber is provided with obstructions for enhancing the frothing of liquid in the second chamber during operation.

An embodiment of a device according to the invention is characterized in that the liquid reservoir is a refillable reservoir.

An embodiment of a device according to the invention is characterized in that the liquid reservoir is provided in an element which is moveable between a first position in which it covers the liquid transport channel, the first chamber, the steam inlet, the restriction, the second chamber and the liquid outlet during operation, and a second position in which it reveals these components for cleaning purposes in a non-operating status.

The invention further relates to a beverage making appliance for use with a device for providing a heated liquid according to the invention, characterized in that the appliance comprises a space for receiving the device for providing a heated liquid.

An embodiment of an appliance according to the invention is characterized in that the appliance comprises a steam generator which is connectable to the steam inlet of the device upon receipt of the device in the space.

An embodiment of an appliance according to the invention is characterized in that the space comprises means for opening a liquid flow path between the reservoir and the liquid channel.

The invention further relates to a system for preparing a beverage, comprising a beverage making appliance according to the invention, and a device for providing a heated liquid according to the invention.

An embodiment of a system according to the invention is characterized in that the appliance has a housing, and the liquid outlet of the device extends outside the housing of the appliance.

The invention will be described in more detail hereinafter with reference to the drawings, in which

Fig. 1 shows a perspective view of a first embodiment of a device according to the invention,

Figs. 2a, b, c, d show a system according to the invention, in different stages during operation,

Fig. 3 shows a schematic view of a further embodiment of a system according to the invention,

Fig. 4 shows a detail of a further embodiment of a device according to the invention, and

Figs. 5a, b show a detail of a further embodiment of a device according to the invention.

Figure 1 shows a perspective view of a first embodiment of a device 1 for providing a heated liquid according to the invention, for use with a beverage making appliance 15, as shown in Figure 2. The device 1 comprises a liquid transport channel 25 in connection with a liquid reservoir 11, which discharges into a first chamber 26, said first chamber 26 comprising a steam inlet 16 which is connectable to a steam generator 32. This will be further elucidated in the description of Figure 3.

In this embodiment, the liquid comprises skimmed milk. However, it is noted that also other known types of liquid such as liquid coffee extract, syrup etc. can be advantageously applied in a device according to the invention. Furthermore, the device comprises a second chamber 28 which is connected to the first chamber 26 via a restriction 27, and which has a liquid outlet 29. The device for providing a heated liquid comprises a cartridge 100 in which the liquid reservoir 11, the liquid transport channel 25, the first chamber 26, the steam inlet 16, the restriction 27, the second chamber 28 and the liquid outlet 29 are provided, and which is at least partly detachably connectable to the beverage making appliance 2. In this embodiment, the cartridge 100 is detachably connectable to the appliance 15 via the steam inlet 16, and the liquid transport channel 25 comprises an air inlet 18. In this manner, a both heated and frothed liquid is generated by the device. In this embodiment, the air inlet 18 is connected to the transport channel 25 via a restriction 30. It is noted that in another embodiment, the restriction may be provided in the beverage making appliance. It is noted that in another embodiment, the cartridge may only comprise a steam inlet and no air inlet; then the device provides only a heated liquid, without froth.

A central part 2 of the cartridge 100 in this embodiment is made from plastic. The top part 4 is a flexible foil made of a material that fulfils requirements in respect to oxygen permeability. This foil 4 has been leak free welded or glued to surface 5 of central



part 2. In this manner all hollow spaces and grooves of the cartridge are separate spaces connected by small channels. The bottom part 6 is also a foil made of the same material as part 4 (Both 4 and 6 have been drawn as transparent foils). At the outer edges, 13 part 6 and 4 have been welded or glued to each other. Another section of foil 6 has been leak free glued or welded to section 8 of central part 2. During storage and transport, the reservoir 11 between foils 4 and 6 is completely filled with milk. Topside 9 of the surrounding wall of trapezium shaped space 10 is part of the welding surface 5. This ensures that top foil 4 is also welded in this position, which prevents milk flowing from reservoir 11 to space 10. The bottom side 12 of the surrounding wall of space 10 is an extension of welding surface 7. This ensures that space 10 is separated from milk reservoir 11 also on the bottom side. The cartridge furthermore comprises a trapezium shaped extension 23 of central part 2, which closes a milk flow path between the reservoir and the transport channel 25. In this embodiment the reservoir is made from a flexible material, but it is noted that it may also comprise other types of material, and may be for example partly rigid. Furthermore, in this embodiment the extension is trapezium shaped, but is noted that this element may also be comprises other known shapes, dependent on the specific embodiment of the cartridge.

The operation of the device and the appliance according to the invention, forming the system according to the invention, will be further elucidated on the basis of Figure 2a, b, c, which show a system according to the invention, in different stages during operation. As can be seen in Figure 2a, the appliance 15 comprises a space 14 for receiving the cartridge 100, and lid 20 and a lock 21 for locking the cartridge 100 in the space 14 during operation. The appliance furthermore comprises a steam socket 17 which is connectable to the steam inlet 16 of the cartridge 100, and an air socket 19 which is connectable to the air inlet 18. Furthermore means 22, in this embodiment an element protruding from the lid, are provided for opening a liquid flow path between the reservoir 11 and the liquid channel 25. It is noted that other known means can be applied to open this liquid flow path, such as for example a pin to pierce the foil.

In Figure 2b, the cartridge 100 has been placed in the appliance 15 by a user. Upon placement of cartridge 100 in the space 14 of appliance 15, the steam inlet 16 of the cartridge 100 connects to the steam socket 17 of the appliance 15. Closing appliance lid 20 and locking this with lock 21 pushes protrusion 22 in lid 20 into the cartridge 100. This changes the position of trapezium shaped extension 23 of central part 2 from the position A, to the position B as shown in Figure 2c. In this manner the foil 6 is peeled from the welded position in 12, which enables milk to flow from reservoir 11 into space 10.

The heating and frothing process starts as soon steam enters the system

through steam inlet 16. This activation of the steam may be initiated automatically after a pre-determined period of time after insertion of the cartridge, or for example upon activation of a button on the appliance by a user. The speed of the steam between steam inlet 16 and restriction 27 creates a vacuum in first chamber 26, by means of which milk from the reservoir, and air are drawn into the first chamber 26. The air is sucked into the milk through air inlet 18 via a small conduit 30. As soon the mixture of milk and air arrives in chamber 26, the hot steam implodes on the milk. In this manner the temperature of the milk is increased. The heated mixture then passes restriction 27 and gets the opportunity to stabilize in space 28 before it leaves the cartridge through outlet 29 as a mix of hot milk and froth that flows into a receiving cup 36, as shown in Figure 2d. As can also be seen in Figure 2d, the liquid outlet 29 of the device extends outside the housing of the appliance 15. Thus, it is ensured that no parts of the appliance come into contact with the milk.

After the milk has left the outlet, the process is de-activated. Any milk residue in the cartridge will remain where it is, because there are no mechanisms causing the milk to flow back to the steam- or air inlet. The lock 21 can be unlocked, and the lid opened, to remove the used cartridge 100. Upon removal of the cartridge, the connections between the steam socket 17 of the appliance 15 and the steam inlet 16 of the cartridge 100, and the air socket 19 of the appliance 15 and the air inlet 18 of the cartridge, are broken. The cartridge then can be thrown away, and a new cartridge can be placed when a new portion of heated, frothed milk is required.

It is noted that the beverage making appliance in Figure 2 is only drawn schematically, and may comprise a variety of known types of beverage making appliances, of different sizes and shapes. The appliance may comprise for example a cup-by-cup coffee maker, a coffee maker with a drip filter, or an espresso machine.

It is furthermore noted that the above described cartridge according to the invention comprises skimmed milk. However, it is also possible to have a cartridge with condensed milk, in order to reduce the total volume of the cartridge. In that case the milk must be diluted with water, as can be seen in Figure 3 showing a further embodiment of the invention. Figure 3 shows a schematic view of the appliance, in connection with the cartridge according to the invention. Cold water is added to the condensed milk in the first chamber 26, through a water inlet 31 (dotted line). The water is then part of the mixture and will be heated together with the milk. A steam generator 32, forming part of the appliance, supplies steam to the steam inlet 16 of the cartridge 100. The steam generator 32 is supplied with water from a

water reservoir 34 by pump 33. Advantageously the water inlet 31 also has a connection to this water reservoir 34, but it may also have a separate water reservoir.

Furthermore, a valve 35 is provided for opening and closing the air inlet 18. In this embodiment, the valve 35 is comprised in the appliance, but it is noted that the valve may also be comprised in the cartridge 100 itself. In this manner a choice can be made whether heated liquid, or heated and frothed liquid is to be provided by the system according to the invention. In addition, as described before, the cartridge may also only have a steam inlet and no air inlet, thus providing only heated liquid, without froth.

In order to improve froth quality and volume, in a further embodiment at least the second chamber 28 is provided with obstructions 36 for enhancing the frothing of liquid in the second chamber 28 during operation, as can be seen in Figure 4. These obstructions change the flow resistance in that space and/or create some extra agitation. The obstructions in this embodiment are arranged around the outlet, but in other embodiments may be arranged at another location in the second chamber, or even additionally in the other chamber.

Figure 5a and 5b show a further embodiment of a device according to the invention, in which the liquid reservoir 11' is a refillable reservoir. The liquid reservoir 11' is provided in an element 30 which is moveable between a first position in which it covers the liquid transport channel 25', the first chamber 26', the steam inlet 16', the restriction 27', the second chamber 28' and the liquid outlet 29' during operation, and a second position in which it reveals these components for cleaning purposes in a non-operating status.

In this manner, the cartridge 100' is refillable by a user, and is easily cleanable by hand, or in the dish washer. The cartridge 100' comprises a bottom part 2' with on its topside a cover 3, a milk reservoir 11', a hinged lid 5 and a lock 6. The cover 3 is made of a flexible material, such as for example rubber, and is tightly and leak free fixed to the topside of the bottom part 2'. It is noted however that in other embodiments, the cover may also comprise other known types of material, and may be for example partly rigid.

Bottom part 2 comprises the liquid transport channel 25', the first chamber 26', the steam inlet 16', the restriction 27', the second chamber 28' and the liquid outlet 29'. The milk reservoir 11' is fixed to the bottom part 2' by hooking extension 16 in groove 17 and by closing lock 6. This total assembly can be placed on an appliance interface in the same way as the disposable cartridge 100 as described before, where it engages with a steam socket and optionally with an air- and water connector.

In this embodiment, the user is enabled to refill the cartridge with fresh liquid, in this embodiment milk. This creates the need for avoiding milk flowing to the frothing device prior to starting of the steaming process. This is done via a liquid valve 45 as shown in Figure 5a, and in more detail in Figure 5b. Valve 45 comprises top flange 190 and bottom flange 200. Top flange 190 has a smaller diameter than bottom flange 200 and connector 220 connects these flanges. With milk reservoir 11' assembled to bottom part 2' and without steam pressure in space 210, the top of the valve 230 closes hole 24 in milk container 4 avoiding milk to leak out. When steaming starts, steam flows through space 210 and enters the first chamber 26' through steam inlet 16'. At the same time steam pressure builds up between flanges 19 and 20. Since the surface area of flange 20 is larger than that of flange 19 the force at the bottom side of the system will be higher than on the topside. As a result bottom flange 20 pulls top flange 19 down through connector 22. This opens hole 24 so that milk can flow to the first chamber 26' via transport channel 25'. As soon the steam pressure drops below a certain level, valve 45 closes immediately. This system caters for a direct coupling between steam and milk flow without steam pressure drop. It is noted that also other known types of valves can be applied in a device according to the invention.

Milk reservoir 11' can be refilled through lid 5 without taking the whole cartridge 100' from the appliance. For the purpose of refilling the reservoir 11', the outside of the transparent reservoir is provided with level indicator lines 25. To provide a more accurate measuring, in this embodiment the reservoir is further provided with an electronic volume-measuring device 26; it is noted however that in other embodiments, only the level indicator lines 25, or the volume-measuring device 26 in itself may be applied.

For cleaning, the complete device is detached from the appliance. By unlocking lock 6, the cartridge 100' can be further disassembled. All channels and spaces which have been in contact with milk, are then easy accessible for cleaning. Only space 210 is not accessible but this space is only in contact with steam and therefore is not liable to hygienic risks.

It is noted that a device for providing a heated liquid according to the invention may be used separately from a beverage making appliance. It then functions as a stand-alone device, and only needs a connection to a steam generator to generate a heated liquid, and optionally an air inlet, if frothing is wanted. In this case, it may even be used as a beverage making device in itself, when the liquid in the reservoir comprises liquid coffee extract.

Furthermore, it may be used together with a beverage making appliance such as a coffee- or espresso maker.

It is furthermore possible to removably attach two cartridges to a beverage making appliance, one with a reservoir comprising milk, and one with a reservoir comprising liquid coffee extract. The cartridges may be attached to the appliance together, in one interface, or successively, first the coffee cartridge, being replaced by the milk cartridge after use.

Furthermore, the cartridge may comprise, at a location before the liquid outlet, an inlet connected to a reservoir for holding dry substances, such as for example chocolate powder. In this manner, the dry substances can be added to the heated and, depending on the embodiment, frothed liquid, in this case for example chocolate powder can be added to the heated and frothed milk, resulting in a hot frothed chocolate milk coming from the liquid outlet.

It is noted that in the described embodiments, the cartridge has a relatively flat construction. The cartridge however may also comprise other shapes and dimensions, depending on for example its use with different types of beverage making appliances, or the specific liquid to be comprised in the reservoir. The cartridge may for example also be shaped like a cup, a sphere, a cube, etc. Furthermore, the various components that are integrated in the cartridge may have other configurations in said cartridge with respect to each other, than described with the mentioned embodiments.



## CLAIMS:

1. A device (1) for providing a heated liquid, said device (1) comprising:
  - a liquid transport channel (25) in connection with a liquid reservoir (11), which discharges into a first chamber (26),
  - said first chamber (26) comprising a steam inlet (16) which is connectable to a steam generator (32),
  - a second chamber (28) which is connected to the first chamber (26) via a restriction (27), and which has a liquid outlet (29),characterized in that the device for providing a heated liquid comprises a cartridge (100) in which the liquid reservoir (11), the liquid transport channel (25), the first chamber (26), the steam inlet (16), the restriction (27), the second chamber (28) and the liquid outlet (29) are provided.
2. A device as claimed in claim 1, for use with a beverage making appliance (15), characterized in that it is at least partly detachably connectable to the beverage making appliance (15).
3. A device as claimed in claim 2, characterized in that the cartridge (100) is detachably connectable to the appliance via the steam inlet (16).
4. A device as claimed in claim 1, characterized in that said liquid transport channel (25) comprises an air inlet (18).
5. A device as claimed in claim 4, characterized in that the air inlet (18) is closable.
6. A device as claimed in claim 5, characterized in that a valve (35) is provided for opening and closing the air inlet (18).
7. A device as claimed in claim 1, characterized in that the liquid comprises milk.

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8. A device as claimed in claim 1, characterized in that the liquid comprises liquid coffee extract.

5 9. A device as claimed in claim 7 or 8, characterized in that the first chamber (26) comprises a water inlet (31) which is connectable to a water reservoir (34).

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10. A device as claimed in claim 1, characterized in that at least the second chamber (28) is provided with obstructions (36) for enhancing the frothing of liquid in the  
10 second chamber (28) during operation.

11. A device as claimed in any of the preceding claims, characterized in that the liquid reservoir (11) is a refillable reservoir (11').

15 12. A device as claimed in claim 11, characterized in that the liquid reservoir (11') is provided in an element (30) which is moveable between a first position in which it covers the liquid transport channel (25), the first chamber (26), the steam inlet (16), the restriction (27), the second chamber (28) and the liquid outlet (29) during operation, and a second position in which it reveals these components for cleaning purposes in a non-operating status.  
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13. A beverage making appliance (2) for use with a device (1) for providing a heated liquid according to any of the preceding claims, characterized in that the appliance comprises a space (14) for receiving the device for providing a heated liquid.

25 14. A beverage making appliance (2) as claimed in claim 13, characterized in that the appliance comprises a steam generator (32) which is connectable to the steam inlet of the device upon receipt of the device in the space (14).

15. A beverage making appliance (2) as claimed in claim 14, characterized in that  
30 the appliance comprises means (22) for opening a liquid flow path between the reservoir (11) and the liquid channel (25).



16. A system for preparing a beverage, comprising a beverage making appliance according to any of the claims 13-15, and a device for providing a heated liquid according to any of the claims 1-12.

5 17. A system as claimed in claim 16, characterized in that the appliance has a housing, and the liquid outlet of the device extends outside the housing of the appliance.



**ABSTRACT:**

The invention relates to a device (1) for providing a heated liquid, for use with a beverage making appliance (15), said device (1) comprising a liquid transport channel (25) in connection with a liquid reservoir (11), which discharges into a first chamber (26), said first chamber (26) comprising a steam inlet (16) which is connectable to a steam generator (32), a second chamber (28) which is connected to the first chamber (26) via a restriction (27), and which has a liquid outlet (29), wherein the device for providing a heated liquid comprises a cartridge (100) in which the liquid reservoir (11), the liquid transport channel (25), the first chamber (26), the steam inlet (16), the restriction (27), the second chamber (28) and the liquid outlet (29) are provided. Because of the fact that all components of the device are integrated into one cartridge, the cartridge can be disposed off after use. Thus a hygienic device is provided which is also user-friendly because it does not have to be cleaned after use.

Fig. 1



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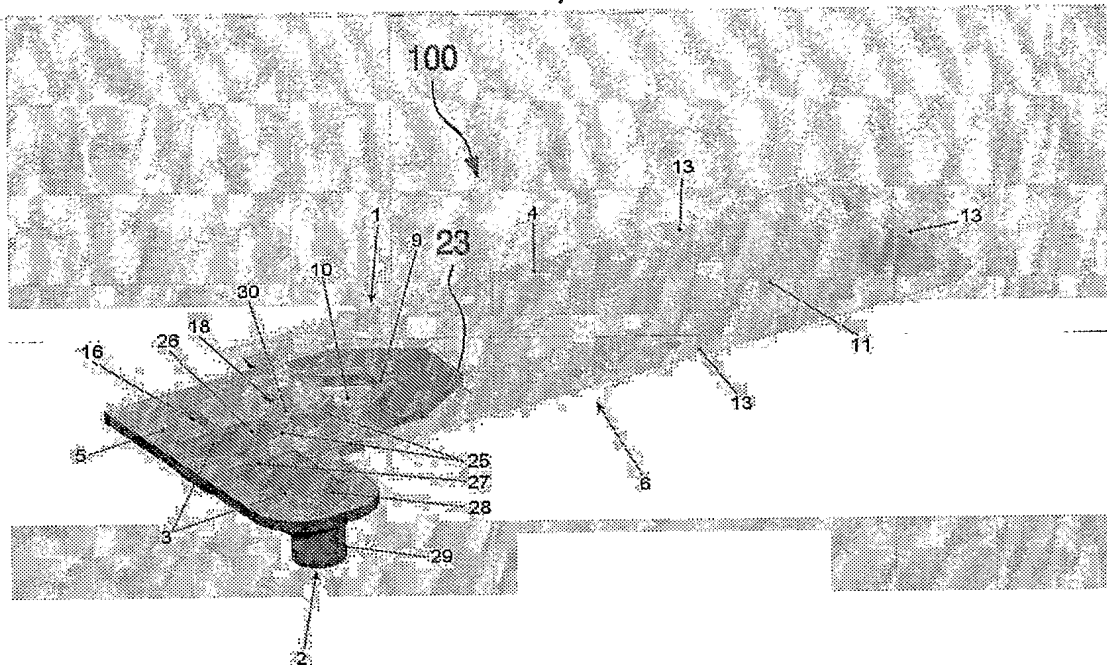


Fig.1

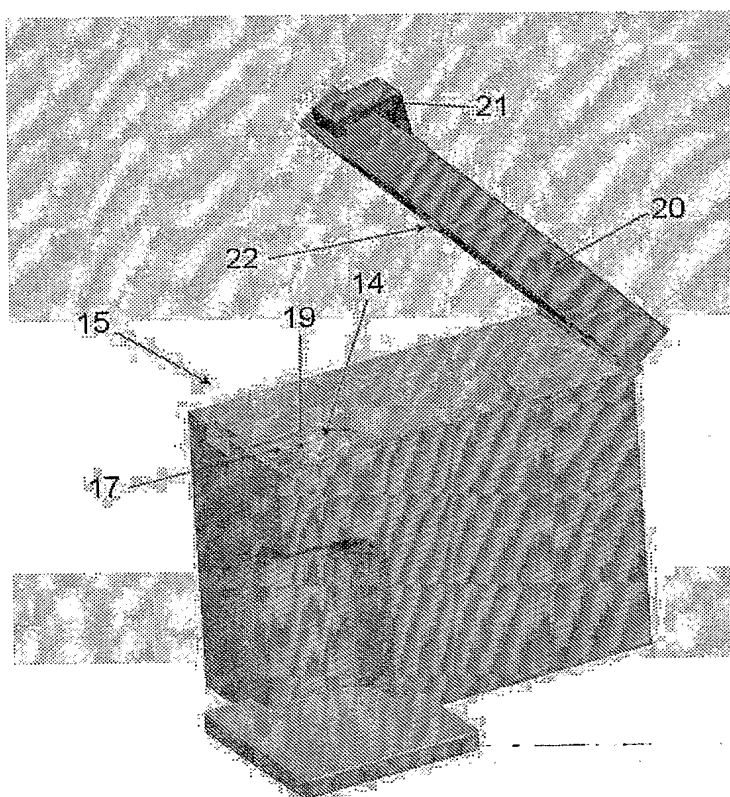


Fig.2a

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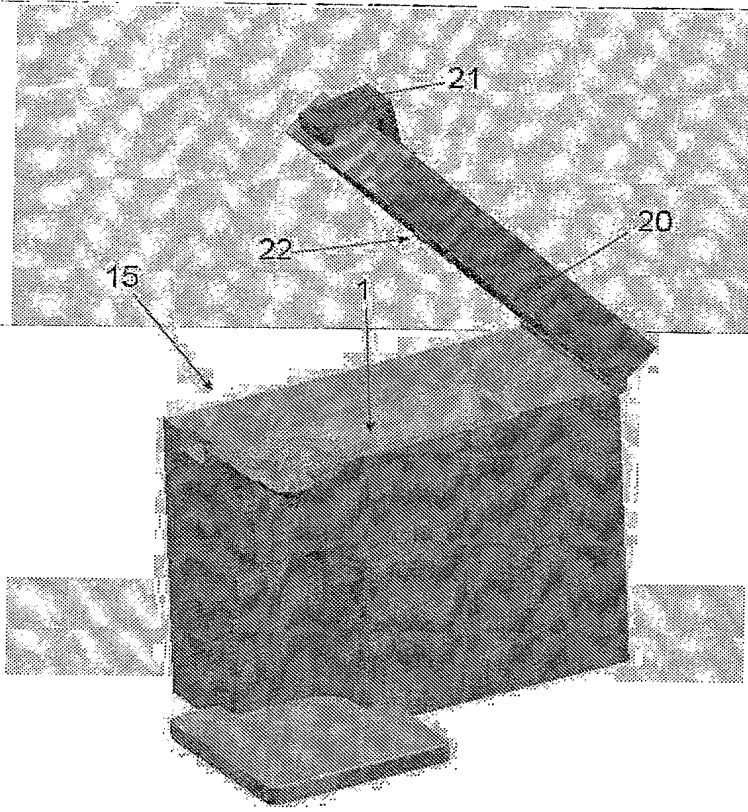


Fig.2b

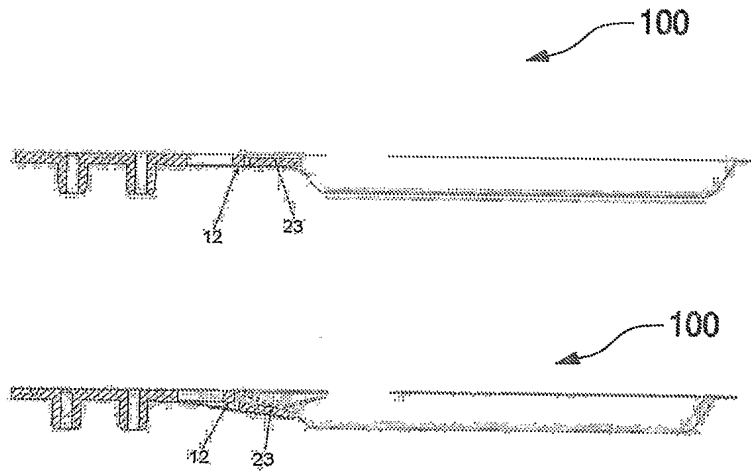


Fig.2c

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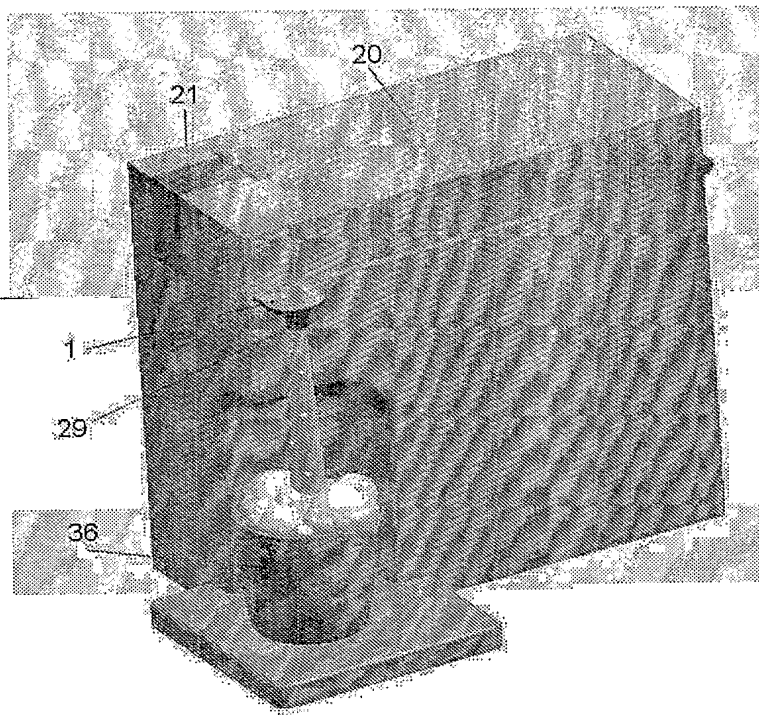


Fig.2d

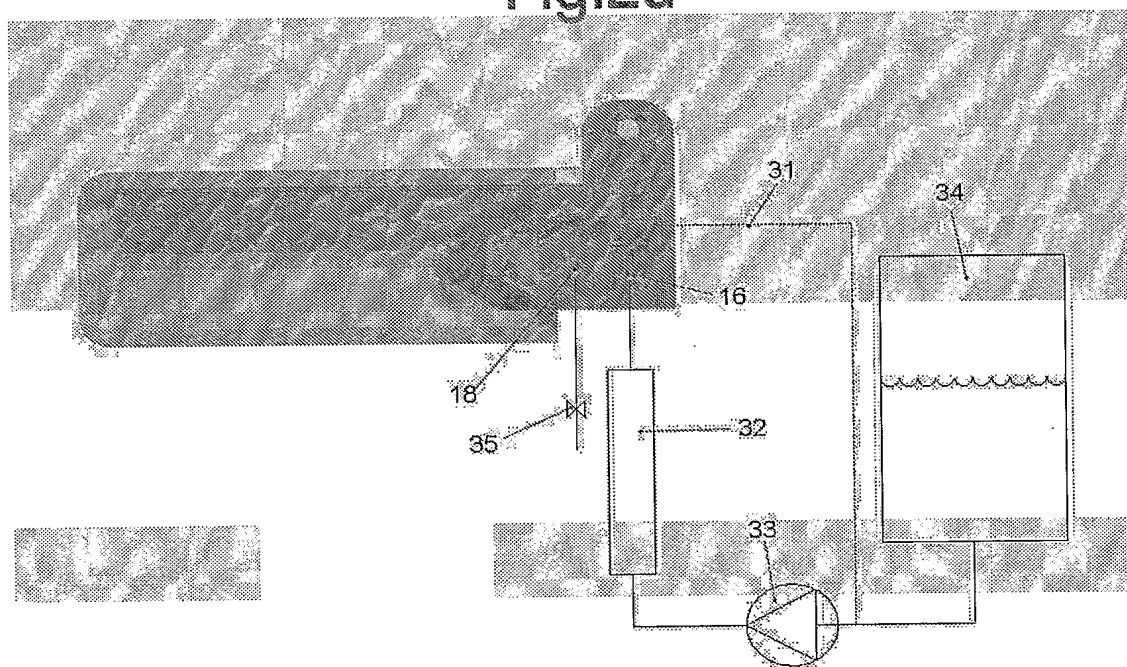


Fig.3

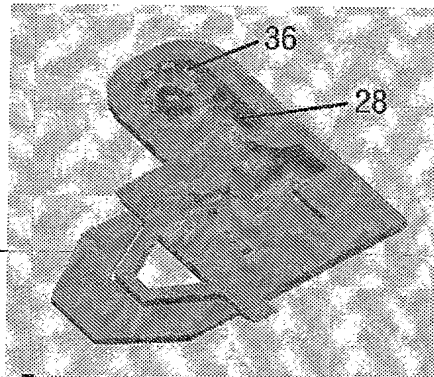


FIG. 4

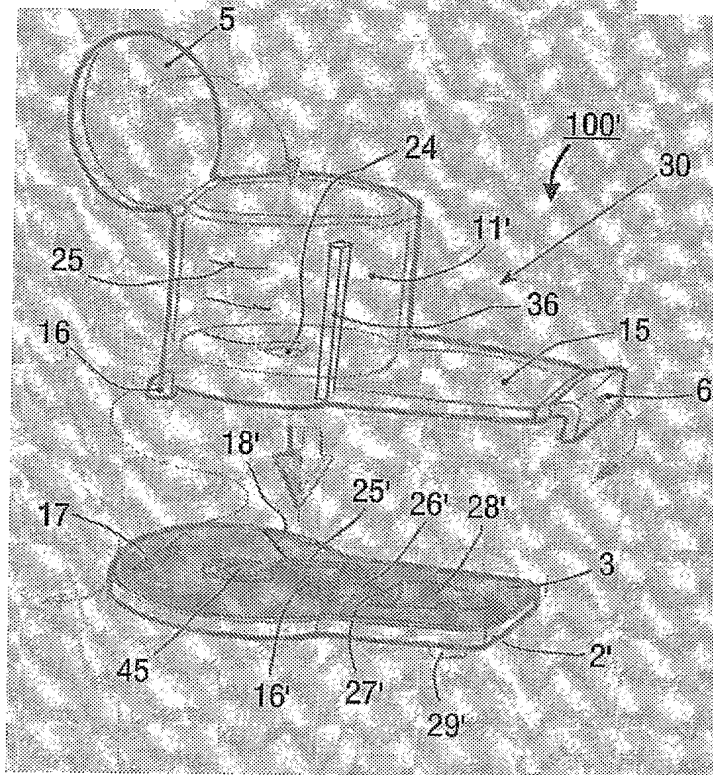


FIG. 5a

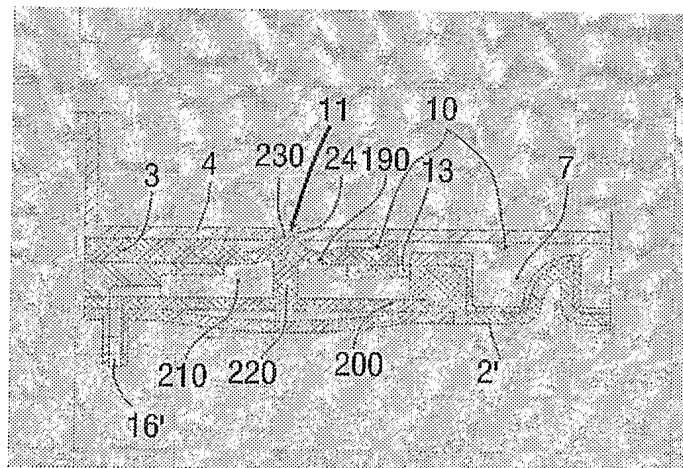


FIG. 5b





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